ALGEBRA

1 Evaluate

a 8^2 **b** 6^3 **c** 7^0 **d** $(-5)^4$ **e** $(-3)^5$ **f** $(\frac{1}{2})^4$

g $(\frac{2}{3})^3$ **h** $(-\frac{1}{4})^3$ **i** $(1\frac{1}{3})^2$ **j** $(1\frac{1}{2})^4$ **k** $(0.1)^5$ **l** $(-0.2)^3$

2 Write in the form 2^n

a $2^5 \times 2^3$ **b** 2×2^6 **c** 1 **d** $2^6 \div 2^2$ **e** $2^{15} \div 2^6$ **f** $(2^7)^2$

3 Simplify

a $2p^2 \times 4p^5$ **b** $x^2 \times x^3 \times x^5$ **c** $12n^7 \div 2n^2$ **d** $(y^3)^4$

e $(2b)^3 \div 4b^2$ **f** $p^3q \times pq^2$ **g** $x^4y^3 \div xy^2$ **h** $2r^2s \times 3s^2$

i $6x^5y^8 \div 3x^2y$ **j** $6a^4b^5 \times \frac{2}{3}ab^3$ **k** $(5rs^2)^3 \div (10rs)^2$ **l** $3p^4q^3 \div \frac{1}{5}pq^2$

4 Evaluate

a 3^{-2} **b** $(\frac{2}{5})^0$ **c** $(-2)^{-6}$ **d** $(\frac{1}{6})^{-2}$ **e** $(1\frac{1}{2})^{-3}$ **f** $9^{\frac{1}{2}}$

g $16^{\frac{1}{4}}$ **h** $(-27)^{\frac{1}{3}}$ **i** $(\frac{1}{49})^{\frac{1}{2}}$ **j** $125^{\frac{1}{3}}$ **k** $(\frac{4}{9})^{\frac{1}{2}}$ **l** $36^{-\frac{1}{2}}$

m $81^{-\frac{1}{4}}$ **n** $(-64)^{-\frac{1}{3}}$ **o** $(\frac{1}{32})^{-\frac{1}{5}}$ **p** $(-\frac{8}{125})^{\frac{1}{3}}$ **q** $(2\frac{1}{4})^{\frac{1}{2}}$ **r** $(3\frac{3}{8})^{-\frac{1}{3}}$

5 Evaluate

a $4^{\frac{3}{2}}$ **b** $27^{\frac{2}{3}}$ **c** $16^{\frac{3}{4}}$ **d** $(-125)^{\frac{2}{3}}$ **e** $9^{\frac{5}{2}}$ **f** $8^{-\frac{2}{3}}$

g $36^{-\frac{3}{2}}$ **h** $(\frac{1}{8})^{\frac{4}{3}}$ **i** $(\frac{4}{9})^{\frac{3}{2}}$ **j** $(\frac{1}{216})^{-\frac{2}{3}}$ **k** $(\frac{9}{16})^{-\frac{3}{2}}$ **l** $(-\frac{27}{64})^{\frac{4}{3}}$

m $(0.04)^{\frac{1}{2}}$ **n** $(2.25)^{-\frac{3}{2}}$ **o** $(0.064)^{\frac{2}{3}}$ **p** $(1\frac{9}{16})^{-\frac{3}{2}}$ **q** $(5\frac{1}{16})^{\frac{3}{4}}$ **r** $(2\frac{10}{27})^{-\frac{4}{3}}$

6 Work out

a $4^{\frac{1}{2}} \times 27^{\frac{1}{3}}$ **b** $16^{\frac{1}{4}} + 25^{\frac{1}{2}}$ **c** $8^{-\frac{1}{3}} \div 36^{\frac{1}{2}}$ **d** $(-64)^{\frac{1}{3}} \times 9^{\frac{3}{2}}$

e $(\frac{1}{3})^{-2} - (-8)^{\frac{1}{3}}$ **f** $(\frac{1}{25})^{\frac{1}{2}} \times (\frac{1}{4})^{-2}$ **g** $81^{\frac{3}{4}} - (\frac{1}{49})^{-\frac{1}{2}}$ **h** $(\frac{1}{27})^{-\frac{1}{3}} \times (\frac{4}{9})^{-\frac{3}{2}}$

i $(\frac{1}{9})^{-\frac{1}{2}} \times (-32)^{\frac{3}{5}}$ **j** $(121)^{0.5} + (32)^{0.2}$ **k** $(100)^{0.5} \div (0.25)^{1.5}$ **l** $(16)^{-0.25} \times (243)^{0.4}$

7 Simplify

a $x^8 \times x^{-6}$ **b** $y^{-2} \times y^{-4}$ **c** $6p^3 \div 2p^7$ **d** $(2x^{-4})^3$

e $y^3 \times y^{-\frac{1}{2}}$ **f** $2b^{\frac{2}{3}} \times 4b^{\frac{1}{4}}$ **g** $x^{\frac{3}{5}} \div x^{\frac{1}{3}}$ **h** $a^{\frac{1}{2}} \div a^{\frac{4}{3}}$

i $p^{\frac{1}{4}} \div p^{-\frac{1}{5}}$ **j** $(3x^{\frac{2}{5}})^2$ **k** $y \times y^{\frac{5}{6}} \times y^{-\frac{3}{2}}$ **l** $4t^{\frac{3}{2}} \div 12t^{\frac{1}{2}}$

m $\dfrac{b^2 \times b^{\frac{1}{4}}}{b^{\frac{1}{2}}}$ **n** $\dfrac{y^{\frac{1}{2}} \times y^{\frac{1}{3}}}{y}$ **o** $\dfrac{4x^{\frac{2}{3}} \times 3x^{-\frac{1}{6}}}{6x^{\frac{3}{4}}}$ **p** $\dfrac{2a \times a^{\frac{3}{4}}}{8a^{-\frac{1}{2}}}$

8 Solve each equation.

a $x^{\frac{1}{2}} = 6$ **b** $x^{\frac{1}{3}} = 5$ **c** $x^{-\frac{1}{2}} = 2$ **d** $x^{-\frac{1}{4}} = \frac{1}{3}$

e $x^{\frac{3}{2}} = 8$ **f** $x^{\frac{2}{3}} = 16$ **g** $x^{\frac{4}{3}} = 81$ **h** $x^{-\frac{3}{2}} = 27$

9 Express in the form x^k

a $\sqrt{x}$ **b** $\frac{1}{\sqrt[3]{x}}$ **c** $x^2 \times \sqrt{x}$ **d** $\frac{\sqrt[4]{x}}{x}$

e $\sqrt{x^3}$ **f** $\sqrt{x} \times \sqrt[3]{x}$ **g** $(\sqrt{x})^5$ **h** $\sqrt[3]{x^2} \times (\sqrt{x})^3$

10 Express each of the following in the form ax^b, where a and b are rational constants.

a $\frac{4}{\sqrt{x}}$ **b** $\frac{1}{2x}$ **c** $\frac{3}{4x^3}$ **d** $\frac{1}{(3x)^2}$ **e** $\frac{2}{5\sqrt[3]{x}}$ **f** $\frac{1}{\sqrt{9x^3}}$

11 Express in the form 2^k

a 8^2 **b** $(\frac{1}{4})^{-2}$ **c** $(\frac{1}{2})^{\frac{1}{3}}$ **d** $16^{-\frac{1}{6}}$ **e** $8^{\frac{2}{5}}$ **f** $(\frac{1}{32})^{-3}$

12 Express each of the following in the form 3^y, where y is a function of x.

a 9^x **b** 81^{x+1} **c** $27^{\frac{x}{4}}$ **d** $(\frac{1}{3})^x$ **e** 9^{2x-1} **f** $(\frac{1}{27})^{x+2}$

13 Given that $y = 2^x$, express each of the following in terms of y.

a 2^{x+1} **b** 2^{x-2} **c** 2^{2x} **d** 8^x **e** 2^{4x+3} **f** $(\frac{1}{2})^{x-3}$

14 Find the value of x such that

a $2^x = 64$ **b** $5^{x-1} = 125$ **c** $3^{x+4} - 27 = 0$ **d** $8^x - 2 = 0$

e $3^{2x-1} = 9$ **f** $16 - 4^{3x-2} = 0$ **g** $9^{x-2} = 27$ **h** $8^{2x+1} = 16$

i $49^{x+1} = \sqrt{7}$ **j** $3^{3x-2} = \sqrt[3]{9}$ **k** $(\frac{1}{6})^{x+3} = 36$ **l** $(\frac{1}{2})^{3x-1} = 8$

15 Solve each equation.

a $2^{x+3} = 4^x$ **b** $5^{3x} = 25^{x+1}$ **c** $9^{2x} = 3^{x-3}$ **d** $16^x = 4^{1-x}$

e $4^{x+2} = 8^x$ **f** $27^{2x} = 9^{3-x}$ **g** $6^{3x-1} = 36^{x+2}$ **h** $8^x = 16^{2x-1}$

i $125^x = 5^{x-3}$ **j** $(\frac{1}{3})^x = 3^{x-4}$ **k** $(\frac{1}{2})^{1-x} = (\frac{1}{8})^{2x}$ **l** $(\frac{1}{4})^{x+1} = 8^x$

16 Expand and simplify

a $x(x^2 - x^{-1})$ **b** $2x^3(x^{-1} + 3)$ **c** $x^{-1}(3x - x^3)$ **d** $4x^{-2}(3x^5 + 2x^3)$

e $\frac{1}{2}x^2(6x + 4x^{-1})$ **f** $3x^{\frac{1}{2}}(x^{-\frac{1}{2}} - x^{\frac{3}{2}})$ **g** $x^{-\frac{3}{2}}(5x^2 + x^{\frac{7}{2}})$ **h** $x^{\frac{1}{3}}(3x^{\frac{5}{3}} - x^{-\frac{4}{3}})$

i $(x^2 + 1)(x^4 - 3)$ **j** $(2x^5 + x)(x^4 + 3)$ **k** $(x^2 - 2x^{-1})(x - x^{-2})$ **l** $(x^2 - x^{\frac{3}{2}})(x - x^{\frac{1}{2}})$

17 Simplify

a $\frac{x^3 + 2x}{x}$ **b** $\frac{4t^5 - 6t^3}{2t^2}$ **c** $\frac{x^{\frac{3}{2}} - 3x}{x^{\frac{1}{2}}}$ **d** $\frac{y^2(y^3 - 6)}{3y}$

e $\frac{p + p^{\frac{3}{2}}}{p^{\frac{3}{4}}}$ **f** $\frac{8w - 2w^{\frac{1}{2}}}{4w^{-\frac{1}{2}}}$ **g** $\frac{x + 1}{x^{\frac{1}{2}} + x^{-\frac{1}{2}}}$ **h** $\frac{2t^3 - 4t}{t^{\frac{3}{2}} - 2t^{-\frac{1}{2}}}$